REMARKS/ARGUMENTS

Claims 1-12 and 20-26 have been previously withdrawn. Claims 13 and 27 have been amended by the Amendment. Claims 13-19 and 27-32 are currently pending in the application, are rejected, and are at issue.

§ 102 Claim Rejections

Claims 13-19 and 27-32 stand rejected under §§ 102(a) and 102(e) as anticipated by U.S. Patent No. 6,602,620 to Kikitsu et al. ("Kikitsu"). Additionally, claims 13-19 and 27-32 stand rejected under § 102(e) as anticipated by U.S. Publication No. 2003/0222048 to Asakawa et al. ("Asakawa"). Applicants respectfully traverse the Examiner's rejections for at least the following reasons.

Independent claim 13, as amended, recites a magnetic recording disc for magnetic recording, which includes "*a disc substrate having a locking pattern formed therein, the locking pattern comprising a plurality of pits formed in the disc substrate; and a plurality of nanoparticles completely filling the plurality of pits and exhibiting short-range order characteristics, wherein each individual pit includes a plurality of nanoparticles therein.*" (emphasis added). Similarly, independent claim 27 recites a data storage medium for magnetic recording, which includes "*a substrate having a locking pattern formed therein, the locking pattern comprising a plurality of pits formed in the substrate; and a plurality of nanoparticles completely filling the plurality of pits and exhibiting short-range order characteristics, wherein each individual pit includes a plurality of nanoparticles therein.*" (emphasis added). Neither Kikitsu nor Asakawa teach or suggest these limitations.

Kikitsu discloses a magnetic recording medium formed using a self-organized block copolymer mask. As taught by Kikitsu, a continuous non-magnetic film is deposited on a substrate, and a self-organized mask having regularly arrayed holes is displaced on the continuous non-magnetic film. Holes are etched in the continuous non-magnetic film through the mask, and a magnetic material is deposited in the holes, thereby forming magnetic particles, with one magnetic particle to each hole. (Kikitsu, col. 6, lns. 21-30). As shown in Fig. 13 of Kikitsu and the corresponding description, each of the holes formed in the continuous non-magnetic film is formed to receive one magnetic particle. Thus, Kikitsu teaches a magnetic recording medium having regularly arrayed magnetic particles displaced in a non-magnetic film, with each of the particles spaced from one another and separated by the non-magnetic film. (Kikitsu, Fig. 13).

Kikitsu also teaches a reverse-type structure, where a continuous magnetic film is deposited on the substrate, and regularly arrayed holes are etched in the magnetic film using the self-organized mask. A non-magnetic material is deposited in the holes, thereby forming non-magnetic particles, with one non-magnetic particle to each hole. (Kikitsu, col. 6, lns. 43-52). As shown in Fig. 14 of Kikitsu and the corresponding description, each of the holes formed in the continuous magnetic film is formed to receive one non-magnetic particle. Thus, Kikitsu also teaches a magnetic recording medium having regularly arrayed non-magnetic particles displaced in a magnetic film, with each of the particles spaced from one another and separated by the magnetic film. (Kikitsu, Fig. 14).

Asakawa discloses a method of forming a porous structure on the order of nanometers, with the structure being utilizable as it is as a nanostructure of high regularity, or utilizable as a template for forming another nanostructure of high regularity. (Asakawa, para. [0001]) The

material used in forming the porous structure includes a block copolymer and a graft copolymer having two polymer chains with a defined ratio of monomer units. (Asakawa, para. [0009]).

Figs. 4A-C of Asakawa, and the accompanying description, teach how to use the porous structure to form a magnetic recording medium. A solution of an A-B block copolymer and an A homopolymer including metal fine particles is prepared and applied to a substrate to form a film. Annealing the film at a temperature above the glass transition temperature segregates the metal fine particles covered with the A homopolymer on the A polymer chain, such that the metal fine particles are positioned at the central portions of the A polymer phases. (Asakawa, para. [0179]; Fig. 4A). Next, the A polymer phases are selectively etched. (Asakawa, para. [0180]). Then, using the remaining B polymer phase as a mask, holes are formed in the substrate, and the metal fine particles are left remained at the bottom of the holes in the substrate, and are used as seeds to form a magnetic recording medium. (Asakawa, [0181]). As shown in Fig. 4C of Asakawa, one metal fine particle remains in each hole. There is no teaching or suggestion in Asakawa of depositing a plurality of nanoparticles into each pit or hole. Similar to Kikitsu, Asakawa teaches a one particle to one hole approach.

Neither Kikitsu nor Asakawa include any teaching or suggestion of depositing a plurality of nanoparticles in each pit or hole. In fact, the Examiner has alluded to the allowability of the claims by suggesting to Applicants that they reword the claims to distinctly claim that each individual pit must include a plurality of nanoparticles therein. Additionally, the undersigned discussed both Kikitsu and Asakawa with the Examiner, and the Examiner was of the preliminary opinion that both Kikitsu and Asakawa disclosed a one particle to one hole approach. However, the Examiner recommended the filing of an RCE application in order to fully consider Applicants' claim amendments made herein.

In contrast to both Kikitsu and Asakawa, independent claims 13 and 27, as amended, recite that the locking pattern formed in the substrate comprise a plurality of pits formed therein, with a plurality of nanoparticles completely filling the plurality of pits and exhibiting short-range order characteristics, wherein each individual pit includes a plurality of nanoparticles therein. The short-range order characteristics exhibited by the nanoparticles are such that the nanoparticles will form an ordered structure across a short length scale. The locking pattern is formed in the substrate according to the self-assembly coherence length scale of the nanoparticles and, accordingly, the nanoparticles self-assemble therein forming self organized magnetic arrays and planarizing the substrate surface. The self-assembly of the nanoparticles that is due to their short-range order characteristics is influenced by the nature of the interactions exhibited among the nanoparticles, such as, but not limited to, ionic bonds, hydrogen bonds and van der Waals interactions. This self-assembly of nanoparticles due to their short-range order characteristics, as recited in independent claims 13 and 27, is distinctly different from the one particle to one hole approach as taught by Kikitsu and Asakawa.

Accordingly, for at least the above-identified reasons, Applicants submit that independent claims 13 and 27 are allowable over Kikitsu and Asakawa.

Claims 14-19 and 28-32 depend cognately from independent claims 13 and 27, respectively, recite further structural detail further delineating over the prior art, and are also believed allowable.

Conclusion

In summary, neither Kikitsu nor Asakawa teach or suggest a substrate having a locking pattern formed therein, the locking pattern comprising a plurality of pits formed in the substrate,

and a plurality of nanoparticles completely filling the plurality of pits and exhibiting short-range order characteristics, wherein each individual pit includes a plurality of nanoparticles therein.

Thus, for at least the above-identified reasons, Applicants submit that claims 13-19 and 27-32 are allowable over the prior art of record. Reconsideration of pending claims 13-19 and 27-32, allowance and passage to issue are respectfully requested.

It is believed that this Amendment requires no fee above that included for the Request for Continued Examination. However, if an additional fee is required for any reason, the Commissioner is hereby authorized to charge Deposit Account No. 02-4553 the necessary amount.

Respectfully submitted,

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